CPME0543795P

State Intellectual Property Office, P.R. China

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Applicant	ISHIKAWAJIMA-HARIMA HEAVY INDUSTRIES CO., LTD.			**Date of Issue**
Agent	China Patent Agent (H.K.) Ltd.			August 22, 2008
Patent Application No.	200480019353.0	**Application Date**	May 7, 2004	
Title of Invention	THERMOELECTRIC SEMICONDUCTOR MATERIAL, THERMOELECTRIC SEMICONDUCTOR ELEMENT THEREFROM, THERMOELECTRIC MODULE INCLUDING THERMOELECTRIC			

Second Office Action

1. ☑ The examiner has received the Observations, submitted by the applicant on Jul 9, 2008 in response to the ____ Office Action issued by the Patent Office, and on this basis continued to conduct examination as to substance of the captioned patent application.
   ☐ On the basis of the Reexamination Decision made by the Reexamination Board of the Chinese Patent Office on _____ , the examiner has continued to conduct examination as to substance of the captioned patent application.
   ☐

2. Further examination has been conducted in the light of the following application document(s):
   ☐ the amended application document(s) attached to the said observations.
   ☑ the application document(s) at which the previous Office Action is directed, and the replacement sheet(s) of the amended application document(s) attached to the said Observations.
   ☐ the application document(s) at which the previous Office Action is directed.
   ☐ the application document(s) confirmed in the said Reexamination Decision.
   ☐

3. ☑ In this Office Action no new reference documents have been cited.
   ☐ The following reference document(s) is/are cited in this Office Action. (Its/Their serial number(s) shall come after those previously cited and will continue to be used throughout the examination procedure):

Serial No.	Number or Title(s) of Reference Document(s)	Date of Publication (or filing date of interfering appl.)

4. Concluding comments of the examiner:

☐ On the description:
- ☐ The amendment to the description is not in conformity with the provision of Art. 33 of the Patent Law.
- ☐ The content of the application comes within the scope where no patent right shall be granted as prescribed in Art. 5 of the Patent Law.
- ☐ The description is not in conformity with the provision of Art. 26, para. 3 of the Patent Law.
- ☐ The drafting of the description is not in conformity with the provision of Rule 18 of the Implementing Regulations.

☑ On the claims:
- ☐ The amendment to Claim(s) _____ is not in conformity with the provision of Art. 33 of the Patent Law.
- ☐ Claim(s) _____ come(s) within the scope where no patent right shall be granted as prescribed in Art. 25 of the Patent Law.
- ☐ Claim(s) _____ is/are not in conformity with the definition of invention in Rule 2, para. 1 of the Implementing Regulations.
- ☑ Claim(s) 2 possess(es) no novelty as prescribed in Art. 22, para. 2 of the Patent Law.
- ☐ Claim(s) _____ possess(es)no inventiveness as prescribed in Art. 22, para. 3 of the Patent Law.
- ☐ Claim(s) _____ possess(es) no practical applicability as prescribed in Art. 22, para. 4 of the Patent Law.
- ☐ Claim(s) _____ is/are not in conformity with the provision of Art. 26, para. 4 of the Patent Law.
- ☐ Claim(s) _____ is/are not in conformity with the provision of Art. 31, para. 1 of the Patent Law.
- ☑ Claim(s) 1,3,8,12,16,36,72,23-28,48-59,83-93 is/are not in conformity with the provisions of Rule 20 of the Implementing Regulations.
- ☐ Claim(s) _____ is/are not in conformity with the provision of Art. 9 of the Patent Law.
- ☐ Claim(s) _____ is/are not in conformity with the provision of Rule 23 of the Implementing Regulations.

See the text portion of this Office Action for a detailed analysis of the above concluding comments.

5. In view of the above concluding comments, the examiner deems that

☐ the applicant should make amendment to the application document(s) according to the requirements raised in the text portion of this Office Action.

☑ the applicant should expound in his/its observations the reason why the captioned patent application is patentable and make amendment to what is not in conformity with the provisions as pointed out in the text portion of this Office Action, otherwise the said application will be rejected.

☐ the patent application has no substantive content(s) for which the patent right may be obtained, if the applicant has no sufficient reason to demonstrate that the captioned application may be granted a patent right, said the application will be rejected.

6. **The applicant should pay attention to the following matters**:

(1) According to the provision of Art. 37 of the Patent Law, the applicant should submit his/its observations within **two** months from the date of receipt of this Office Action; if, without any justified reason(s), the time limit for making a response is not met, the said application shall be deemed to have been withdrawn.

(2) The amendment(s) made by the applicant to the application should be in conformity with the provisions of Art. 33 of the Patent Law and Rule 51 of the Implementing Regulations thereof, the amended text should be in duplicate and its form should conform to the relevant provisions of the Guidelines for Examination.

(3) The observations and/or amended text of the applicant should be submitted to the Receiving Section of the Chinese Patent Office by mail or by personal delivery, if not submitted Receiving Section by mail or by personal delivery, the document(s) will have no legal effect.

(4) If no appointment is made in advance, the applicant and/or the agent shall not come to the Chinese Patent Office to hold an interview with the examiner.

7. This Office Action consists of the text portion totaling __7__ page(s) and of the following attachment(s):

☐ ____ copy(copies) of the reference document(s) cited totaling ____ page(s).

Examination Dept. No. _____ Examiner _____

2206

Your ref: OSP-19122(04P00336)
Our ref: CPME0543795P
Application No.: 2004800193530

Text of the Second Office Action

1. Claim 2 lacks novelty under Article 22.2 of the Chinese Patent Law.

Claim 2 claims a thermoelectric semiconductor material. D1 (JP2003-37302A), directed to a thermoelectric semiconductor material, has particularly disclosed the following (see paras.0019-0035 and 0047 of the description; and figs.5-8). Namely, said thermoelectric semiconductor material has a compound phase comprising complex compound semiconductor phase and a Te rich phase, the stiochiometric composition of said complex compound semiconductor phase being a $(Bi\text{-}Sb)_2Te_3$ based composition which comprises excess Te. Besides, according to the method of forming said thermoelectric semiconductor material (see para.0028), i.e. making Te excess during the preparation stage, then forming the thermoelectric semiconductor material by conventional methods including melting, cooling, it can be directly and undoubtedly defined by those skilled in the art that the Te rich phase in said thermoelectric semiconductor material is distributed within crystal grains or in grain boundaries of the complex compound semiconductor phase. Thus, D1 has disclosed all technical features described in technical solution of claim 2. Moreover, the technical solution of claim 2 and the technical solution disclosed in D1, which pertain to a single technical field, adopt the same technical solution to solve the same technical problem, and are intended to achieve the same technical effect. Therefore, the technical solution of claim 2 lacks novelty under Article 22.2 of the Chinese Patent Law.

The applicant in the observations emphasized that: D1 doesn't disclose the thermoelectric semiconductor material having a complex compound semiconductor phase, nor disclose a Te rich phase being distributed within crystal grains or in grain boundaries (between crystal grains) of the complex

compound semiconductor phase. However, the present application comprises the same steps of forming a Te rich thermoelectric semiconductor material as in D1, i.e. making Te excess during the preparation stage, then forming by conventional methods including melting, cooling the thermoelectric semiconductor material with excess Te contained therein, so that the thermoelectric semiconductor material can be directly and undoubtedly defined by those skilled in the art, which is formed from the same raw material and by the same method to acquire the same Te rich phase being distributed within crystal grains or in grain boundaries of the complex compound semiconductor phase. Thus, the applicant's arguments are not acceptable.

2. Claims 1, 3, 8, 12, 16, 36 and 72, and claims 23-28, 48-59 and 83-93 respectively recite an indefinite word "quenched", so it is not clear which rate is indicated by "at a rate at which ...is quenched". Thus, said claims are not clear and thereby contrary to the provision of Rule 20.1 of the Implementing Regulations of the Chinese Patent Law.

3. Even if the applicant supplements the feature "defining peripheral speed of the rotatable roller below 5m/s" into independent claims 1, 3, 8, 12, 16, 36 and 72, said independent claims and their dependent claims still lack inventiveness under Article 22.3 of the Chinese Patent Law.

Claim 1 claims a thermoelectric semiconductor material. D1 (JP2003-37302A), directed to a thermoelectric semiconductor material, has disclosed the following (see paras.0019-0035 and 0047 of the description; and figs.1, 6, 7 and 9): layering and packing plate shaped raw thermoelectric semiconductor materials 14 made of a raw alloy having a predetermined composition of a thermoelectric semiconductor to form a layered body; solidifying and forming the layered body to form a compact 61 (see fig.9c); applying pressure by forging to the compact 61 in a uniaxial direction that is perpendicular to a layering direction of the raw thermoelectric semiconductor

materials 14; forming the plate shaped raw thermoelectric semiconductor materials by the molten raw alloy in contact with a surface of a cooling member. Through comparison, differences between claim 1 and D1 lie in the following: when the molten raw alloy is contacted with a surface of a cooling member so as to form the plate shaped raw thermoelectric semiconductor materials, the peripheral speed of the rotatable roller is defined below 5m/s, the molten alloy is cooled and solidified at a rate at which 90% or more of a thickness of the formed plate shaped raw thermoelectric semiconductor material is not quenched. Said distinctive technical features aim to make crystal grains formed in the formed raw thermoelectric semiconductor materials have a length substantially along the whole direction of a plate thickness of a slow cooling box of the raw thermoelectric semiconductor materials so as to form raw thermoelectric semiconductor materials of good crystal orientation. D4 (JP2000-286471A), directed to a method of manufacturing thermoelectric semiconductor materials, has particularly disclosed the following (see para.0022 of the description; and figs.1-4): defining the peripheral speed of the rotatable roller at 2-80m/s, with an object to form raw thermoelectric semiconductor materials of high crystallinity. That is, D1 provides technical suggestion of defining peripheral speed of the rotatable roller to improve crystallinity. Besides, defining the peripheral speed of the rotatable roller below 5m/s relates to a specific speed selected within a possible and limited range disclosed by D1, such a selection may be acquired by those skilled in the art through a conventional means, so as to achieve the effect that the molten alloy is cooled and solidified at a rate at which 90% or more of a thickness of the formed plate shaped raw thermoelectric semiconductor material is not quenched. Thus, acquiring the technical solution of claim 1 on the basis of D1 in combination with D4 is apparent to those skilled in the art and doesn't bring any unexpected technical effect. Therefore, claim 1 neither has any prominent substantive features nor represents a notable progress, and hence is non-inventive.

Claim 8 claims a thermoelectric semiconductor element. D1 (JP2003-37302A), directed to a thermoelectric semiconductor material, has disclosed the following (see paras.0019-0035 and 0047 of the description; and figs.1, 6, 7 and 9): layering and packing plate shaped raw thermoelectric semiconductor materials 14 made of a raw alloy having a predetermined composition of a thermoelectric semiconductor to form a layered body; solidifying and forming the layered body to form a compact 61 (see fig.9c); applying pressure by forging to the compact 61 in a uniaxial direction that is perpendicular to a layering direction of the raw thermoelectric semiconductor materials 14; forming the plate shaped raw thermoelectric semiconductor materials by the molten raw alloy in contact with a surface of a cooling member. Through comparison, differences between claim 8 and D1 lie in the following: 1) cutting out a thermoelectric semiconductor element from the thermoelectric semiconductor material so that a plane approximately perpendicular to the uniaxial direction in which the shear force is applied during the plastic deformation of the compact can be used as a contact surface with an electrode; 2) when the molten raw alloy is contacted with a surface of a cooling member so as to form the plate shaped raw thermoelectric semiconductor materials, the peripheral speed of the rotatable roller is defined below 5m/s, the molten alloy is cooled and solidified at a rate at which 90% or more of a thickness of the formed plate shaped raw thermoelectric semiconductor material is not quenched. Said distinctive technical feature 1) aim to manufacture the thermoelectric semiconductor materials into thermoelectric semiconductor elements and make current of the elements flow in a direction of thickness of layered films, while said distinctive feature 2) aims to make crystal grains formed in the formed raw thermoelectric semiconductor materials have a length substantially along the whole direction of a plate thickness of a slow cooling box of the raw thermoelectric semiconductor materials so as to form raw thermoelectric semiconductor materials of good crystal orientation.

As to said distinctive feature 1), D2 (JP5-335628), directed to a

thermoelectric semiconductor element, has disclosed the following (see paras.0019-0020 and 0028-0040 of the description; and fig.1): melting and cooling a raw alloy having a predetermined composition of a thermoelectric semiconductor to form a plate shaped raw thermoelectric semiconductor materials; solidifying and forming the layered body to form a thermoelectric semiconductor material; cutting out the thermoelectric semiconductor material to form an electrode 6 in a direction vertical to the film thickness, the current flowing along a direction parallel to the film thickness; besides, said feature 1) functions the same in D2 as in the present invention. As to said distinctive feature 2), D4 (JP2000-286471A), directed to a method of manufacturing thermoelectric semiconductor materials, has particularly disclosed the following (see para.0022 of the description; and figs.1-4): defining the peripheral speed of the rotatable roller at 2-80m/s, with an object to form raw thermoelectric semiconductor materials of high crystallinity. That is, D1 provides technical suggestion of defining peripheral speed of the rotatable roller to improve crystallinity. Besides, defining the peripheral speed of the rotatable roller below 5m/s relates to a specific speed selected within a possible and limited range disclosed by D1, such a selection may be acquired by those skilled in the art through a conventional means, so as to achieve the effect that the molten alloy is cooled and solidified at a rate at which 90% or more of a thickness of the formed plate shaped raw thermoelectric semiconductor material is not quenched. Thus, acquiring the technical solution of claim 8 on the basis of D1 in combination with D2 and D4 is apparent to those skilled in the art and doesn't bring any unexpected technical effect. Therefore, claim 8 neither has any prominent substantive features nor represents a notable progress, and hence is non-inventive.

Claim 12 claims a thermoelectric module. D3 (CN1233347A), directed to a thermoelectric module, has disclosed the following (see page 14, para.3 to page 16, para.1; and page 1, para.3 of the description; and fig.12): plastically

deforming respectively plate shaped raw thermoelectric semiconductor materials made of a raw alloy comprising a composition of P type thermoelectric semiconductor, and plate shaped raw thermoelectric semiconductor materials made of a raw alloy comprising a composition of N type thermoelectric semiconductor to form P type and N type thermoelectric semiconductor materials; cutting out P type and N type thermoelectric semiconductor elements 5, 6 from the P type and N type thermoelectric semiconductor materials so that planes perpendicular to film thickness can be used as contact surfaces with an electrode; arranging the P type and N type thermoelectric semiconductor elements in a crystallographic orientation of high thermoelectric capacity; joining the P type and the N type thermoelectric semiconductor elements 5, 6 via a metal electrode 7 to form a PN element pair, said thermoelectric module having a structure provided with said PN element pair. Through comparison, differences between claim 12 and D3 lie in the following: 1) layering and packing respectively the raw thermoelectric semiconductor materials, and solidifying and forming them to form compacts; applying pressure to the compacts having the compositions of P type and N type thermoelectric semiconductor in an axial direction perpendicular or approximately perpendicular to a main layering direction of the raw thermoelectric semiconductor materials; and thereby applying shear force in an axial direction approximately parallel to the main layering direction of the raw thermoelectric semiconductor materials for plastically deforming manufacturing; 2) when the molten raw alloy is contacted with a surface of a cooling member so as to form the plate shaped raw thermoelectric semiconductor materials, the peripheral speed of the rotatable roller is defined below 5m/s, the molten alloy is cooled and solidified at a rate at which 90% or more of a thickness of the formed plate shaped raw thermoelectric semiconductor material is not quenched. Said distinctive technical feature 1) aim to manufacture the raw thermoelectric semiconductor materials into thermoelectric semiconductor materials by layering and plastically deforming manufacturing, while said distinctive feature 2) aims to make crystal grains formed in the formed raw thermoelectric semiconductor

materials have a length substantially along the whole direction of a plate thickness of a slow cooling box of the raw thermoelectric semiconductor materials so as to form raw thermoelectric semiconductor materials of good crystal orientation.

As to said distinctive feature 1), D1 (JP2003-37302A), directed to a thermoelectric semiconductor material, has disclosed the following (see paras.0019-0035 and 0047 of the description; and figs.1, 6, 7 and 9): layering and packing plate shaped raw thermoelectric semiconductor materials 14 made of a raw alloy having a predetermined composition of a thermoelectric semiconductor to form a layered body; solidifying and forming the layered body to form a compact 61 (see fig.9c); applying pressure by forging to the compact 61 in a uniaxial direction that is perpendicular to a layering direction of the raw thermoelectric semiconductor materials 14. Said technical feature functions in D1 to manufacture the raw thermoelectric semiconductor materials into thermoelectric semiconductor materials by layering and plastically deforming manufacturing, which is the same as in the present invention. Thus, D1 provides suggestion of applying said technical feature to D3 to solve its existing technical problem. As to said distinctive feature 2), D4 (JP2000-286471A), directed to a method of manufacturing thermoelectric semiconductor materials, has particularly disclosed the following (see para.0022 of the description; and figs.1-4): defining the peripheral speed of the rotatable roller at 2-80m/s, with an object to form raw thermoelectric semiconductor materials of high crystallinity. That is, D1 provides technical suggestion of defining peripheral speed of the rotatable roller to improve crystallinity. Besides, defining the peripheral speed of the rotatable roller below 5m/s relates to a specific speed selected within a possible and limited range disclosed by D1, such a selection may be acquired by those skilled in the art through a conventional means, so as to achieve the effect that the molten alloy is cooled and solidified at a rate at which 90% or more of a thickness of the formed plate shaped raw thermoelectric semiconductor material is not quenched. Thus, acquiring the technical solution of claim 12 on the basis

of D3 in combination with D2 and D4 is apparent to those skilled in the art and doesn't bring any unexpected technical effect. Therefore, claim 12 neither has any prominent substantive features nor represents a notable progress, and hence is non-inventive.

Claim 16 claims a manufacturing method for a thermoelectric semiconductor material. D1 (JP2003-37302A), directed to a manufacturing method for a thermoelectric semiconductor material, has disclosed the following (see paras.0019-0035 and 0047 of the description; and figs.1, 6, 7 and 9): melting a raw alloy 41 having a predetermined composition of a thermoelectric semiconductor, having the raw alloy 41 to be contacted with a surface of a cooling member 14 to form plate shaped raw thermoelectric semiconductor materials 14; layering and packing the plate shaped raw thermoelectric semiconductor materials in a direction parallel to a plate thickness to form a layered body, solidifying and forming the layered body to form a compact 61; applying pressure by forging to the compact 61 (see fig.9c) in the other axial direction, while preventing deformation of the compact in one of two axial directions which are crossing each other in a plane perpendicular to the layering direction of the raw thermoelectric semiconductor materials 14; and thereby applying shear force in an axial direction parallel to the layering direction of the raw thermoelectric semiconductor materials 14; and plastically deforming the compact to form a thermoelectric semiconductor material. Through comparison, differences between claim 16 and D1 lie in the following: when the molten raw alloy is contacted with a surface of a cooling member so as to form the plate shaped raw thermoelectric semiconductor materials, the peripheral speed of the rotatable roller is defined below 5m/s, the molten alloy is cooled and solidified at a rate at which 90% or more of a thickness of the formed plate shaped raw thermoelectric semiconductor material is not quenched. Said distinctive technical features aim to make crystal grains formed in the formed raw thermoelectric semiconductor materials have a length substantially along the whole direction of

a plate thickness of a slow cooling box of the raw thermoelectric semiconductor materials so as to form raw thermoelectric semiconductor materials of good crystal orientation. D4 (JP2000-286471A), directed to a method of manufacturing thermoelectric semiconductor materials, has particularly disclosed the following (see para.0022 of the description; and figs.1-4): defining the peripheral speed of the rotatable roller at 2-80m/s, with an object to form raw thermoelectric semiconductor materials of high crystallinity. That is, D1 provides technical suggestion of defining peripheral speed of the rotatable roller to improve crystallinity. Besides, defining the peripheral speed of the rotatable roller below 5m/s relates to a specific speed selected within a possible and limited range disclosed by D1, such a selection may be acquired by those skilled in the art through a conventional means, so as to achieve the effect that the molten alloy is cooled and solidified at a rate at which 90% or more of a thickness of the formed plate shaped raw thermoelectric semiconductor material is not quenched. Thus, acquiring the technical solution of claim 16 on the basis of D1 in combination with D4 is apparent to those skilled in the art and doesn't bring any unexpected technical effect. Therefore, claim 16 neither has any prominent substantive features nor represents a notable progress, and hence is non-inventive.

Claim 36 claims a manufacturing method for a thermoelectric semiconductor element. D1 (JP2003-37302A), directed to a manufacturing method for a thermoelectric semiconductor element, has disclosed the following (see paras.0019-0035 and 0047 of the description; and figs.1, 6, 7 and 9): melting a raw alloy 41 having a predetermined composition of a thermoelectric semiconductor, having the raw alloy 41 to be contacted with a surface of a cooling member 14 to form plate shaped raw thermoelectric semiconductor materials 14; layering and packing the plate shaped raw thermoelectric semiconductor materials in a direction parallel to a plate thickness to form a layered body, solidifying and forming the layered body to form a compact 61;

applying pressure by forging to the compact 61 (see fig.9c) in the other axial direction, while preventing deformation of the compact in one of two axial directions which are crossing each other in a plane perpendicular to the layering direction of the raw thermoelectric semiconductor materials 14; and thereby applying shear force in an axial direction parallel to the layering direction of the raw thermoelectric semiconductor materials 14; and plastically deforming the compact to form a thermoelectric semiconductor material. Through comparison, differences between claim 36 and D1 lie in the following: 1) cutting out a thermoelectric semiconductor element from the thermoelectric semiconductor material so that a plane approximately perpendicular to the uniaxial direction in which the shear force is applied during the plastic deformation of the compact can be used as a contact surface with an electrode, so as to form a thermoelectric semiconductor element; 2) when the molten raw alloy is contacted with a surface of a cooling member so as to form the plate shaped raw thermoelectric semiconductor materials, the peripheral speed of the rotatable roller is defined below 5m/s, the molten alloy is cooled and solidified at a rate at which 90% or more of a thickness of the formed plate shaped raw thermoelectric semiconductor material is not quenched. Said distinctive technical feature 1) aim to manufacture the thermoelectric semiconductor materials into thermoelectric semiconductor elements and make current of the elements flow in a direction of thickness of layered films, while said distinctive feature 2) aims to make crystal grains formed in the formed raw thermoelectric semiconductor materials have a length substantially along the whole direction of a plate thickness of a slow cooling box of the raw thermoelectric semiconductor materials so as to form raw thermoelectric semiconductor materials of good crystal orientation.

As to said distinctive feature 1), D2 (JP5-335628), directed to a manufacturing method for a thermoelectric semiconductor element, has disclosed the following (see paras.0019-0020 and 0028-0040 of the description; and fig.1): melting and cooling a raw alloy having a predetermined composition of a thermoelectric semiconductor to form a plate shaped raw thermoelectric

semiconductor materials; solidifying and forming the layered body to form a thermoelectric semiconductor material; cutting out the thermoelectric semiconductor material to form an electrode 6 in a direction vertical to the film thickness, the current flowing along a direction parallel to the film thickness to form a thermoelectric semiconductor element; besides, said feature 1) functions the same in D2 as in the present invention. As to said distinctive feature 2), D4 (JP2000-286471A), directed to a method of manufacturing thermoelectric semiconductor materials, has particularly disclosed the following (see para.0022 of the description; and figs.1-4): defining the peripheral speed of the rotatable roller at 2-80m/s, with an object to form raw thermoelectric semiconductor materials of high crystallinity. That is, D1 provides technical suggestion of defining peripheral speed of the rotatable roller to improve crystallinity. Besides, defining the peripheral speed of the rotatable roller below 5m/s relates to a specific speed selected within a possible and limited range disclosed by D1, such a selection may be acquired by those skilled in the art through a conventional means, so as to achieve the effect that the molten alloy is cooled and solidified at a rate at which 90% or more of a thickness of the formed plate shaped raw thermoelectric semiconductor material is not quenched. Thus, acquiring the technical solution of claim 36 on the basis of D1 in combination with D2 and D4 is apparent to those skilled in the art and doesn't bring any unexpected technical effect. Therefore, claim 36 neither has any prominent substantive features nor represents a notable progress, and hence is non-inventive.

Claim 72 claims a manufacturing method for a thermoelectric module. D3 (CN1233347A), also directed to a manufacturing method for a thermoelectric module, has disclosed the following (see page 14, para.3 to page 16, para.1; and page 1, para.3 of the description; and fig.12): melting raw alloys having a composition of P type thermoelectric semiconductor and a composition of N type thermoelectric semiconductor respectively; cooling slowly each molten alloy by being contacted with a surface of cooling member to form plate shaped raw

thermoelectric semiconductor materials having compositions of P type and N type thermoelectric semiconductors respectively; plastically deforming the raw thermoelectric semiconductor materials respectively to form P type and N type thermoelectric semiconductor materials; cutting out P type and N type thermoelectric semiconductor elements 5, 6 from the P type and N type thermoelectric semiconductor materials so that planes perpendicular to film thickness can be used as contact surfaces with an electrode; arranging the P type and N type thermoelectric semiconductor elements in a crystallographic orientation of high thermoelectric capacity; joining the P type and the N type thermoelectric semiconductor elements 5, 6 via a metal electrode 7 to form a PN element pair, said thermoelectric module having a structure provided with said PN element pair. Through comparison, differences between claim 72 and D3 lie in the following: 1) having the P type and N type raw thermoelectric semiconductor materials layered approximately parallel in a direction of plate thickness to form layered bodies, solidifying and forming the layered bodies to form compacts; then, applying pressure to the compact in the other axial direction, while preventing deformation of each of the compacts having the compositions of P type and N type thermoelectric semiconductor in one of two axial directions which are crossing each other in a plane approximately perpendicular to the main layering direction of the raw thermoelectric semiconductor materials, and thereby applying shear force in an axial direction approximately parallel to the main layering direction of the raw thermoelectric semiconductor materials; 2) when the molten raw alloy is contacted with a surface of a cooling member so as to form the plate shaped raw thermoelectric semiconductor materials, the peripheral speed of the rotatable roller is defined below 5m/s, the molten alloy is cooled and solidified at a rate at which 90% or more of a thickness of the formed plate shaped raw thermoelectric semiconductor material is not quenched. Said distinctive technical feature 1) aim to manufacture the raw thermoelectric semiconductor materials respectively into P type and N type thermoelectric semiconductor materials by layering and plastically

deforming manufacturing, while said distinctive feature 2) aims to make crystal grains formed in the formed raw thermoelectric semiconductor materials have a length substantially along the whole direction of a plate thickness of a slow cooling box of the raw thermoelectric semiconductor materials so as to form raw thermoelectric semiconductor materials of good crystal orientation.

As to said distinctive feature 1), D1 (JP2003-37302A), directed to a manufacturing method for a thermoelectric semiconductor material, has disclosed the following (see paras.0019-0035 and 0047 of the description; and figs.1, 6, 7 and 9): claims a manufacturing method for a thermoelectric semiconductor element. D1 (JP2003-37302A), directed to a manufacturing method for a thermoelectric semiconductor element, has disclosed the following (see paras.0019-0035 and 0047 of the description; and figs.1, 6, 7 and 9): melting a raw alloy 41 having a predetermined composition of a thermoelectric semiconductor, having the raw alloy 41 to be contacted with a surface of a cooling member 14 to form plate shaped raw thermoelectric semiconductor materials 14; layering and packing the plate shaped raw thermoelectric semiconductor materials in a direction parallel to a plate thickness to form a layered body, solidifying and forming the layered body to form a compact 61; applying pressure by forging to the compact 61 (see fig.9c) in the other axial direction, while preventing deformation of the compact in one of two axial directions which are crossing each other in a plane perpendicular to the layering direction of the raw thermoelectric semiconductor materials 14; and thereby applying shear force in an axial direction parallel to the layering direction of the raw thermoelectric semiconductor materials 14; and plastically deforming the compact to form a thermoelectric semiconductor material. Said technical feature functions in D1 to manufacture the raw thermoelectric semiconductor materials into thermoelectric semiconductor materials by layering and plastically deforming manufacturing, which is the same as in the present invention. As to said distinctive feature 2), D4 (JP2000-286471A), directed to a method of manufacturing thermoelectric semiconductor materials, has particularly disclosed

the following (see para.0022 of the description; and figs.1-4): defining the peripheral speed of the rotatable roller at 2-80m/s, with an object to form raw thermoelectric semiconductor materials of high crystallinity. That is, D1 provides technical suggestion of defining peripheral speed of the rotatable roller to improve crystallinity. Besides, defining the peripheral speed of the rotatable roller below 5m/s relates to a specific speed selected within a possible and limited range disclosed by D1, such a selection may be acquired by those skilled in the art through a conventional means, so as to achieve the effect that the molten alloy is cooled and solidified at a rate at which 90% or more of a thickness of the formed plate shaped raw thermoelectric semiconductor material is not quenched. Thus, acquiring the technical solution of claim 72 on the basis of D1 in combination with D2 and D4 is apparent to those skilled in the art and doesn't bring any unexpected technical effect. Therefore, claim 72 neither has any prominent substantive features nor represents a notable progress, and hence is non-inventive.

Dependent claims 4-7, 9-11, 13-15, 17-35, 37-71 and 73-115 are not amended at all concerning their additional technical features, except being adaptably renumbered. Based on comments in the first OA, when the referred claims lack inventiveness, said dependent claims are non-inventive under Article 22.3 of the Chinese Patent Law.

The applicant may supplement the feature "defining peripheral speed of the rotatable roller below 2m/s" into independent claims 1, 3, 8, 12, 16, 36 and 72 to overcome the above-mentioned defects.

3. Technical features of dependent claims 23-28, 48-59 and 83-93 have already been directly or indirectly recorded in their referred independent claims 16, 36 and 72 respectively, so that repeated definition occurs. Thus, said dependent claims render the claims not concise and thereby contrary to the

provision of Rule 20.1 of the Implementing Regulations of the Chinese Patent Law.

4. Due to the foregoing reasons, the application based on the current text cannot be granted a patent right yet. The applicant should file the amended application documents within the specified two months time limit prescribed herein for response. Any amendments shall comply with the provision of Article 33 of the Chinese Patent Law and may not go beyond the scope of the disclosure contained in the original description and claims. He should also state arguments in the observations that the amended claims are novel and inventive over those documents for reference cited herein.

Examiner: Liu Tianfei

Code No.: 9751

中华人民共和国国家知识产权局

100032 北京市西城区金融街27号投资广场B座19层 中国专利代理(香港)有限公司 温大鹏	发文日
申请号：2004800193530	
申请人：石川岛播磨重工业株式会社	
发明名称：热电半导体材料、由该热电半导体材料制作的热电半导体元件、使用该热电半导体元件的热电模块及它们的制造方法	

国家知识产权局 2008.08.22 发文

第 2 次审查意见通知书

1. ☑审查员已收到申请人于2008年7月9日提交的意见陈述书，在此基础上审查员对上述专利申请继续进行实质审查。

☐根据国家知识产权局专利复审委员会于　　年　月　日作出的复审决定，审查员对上述专利申请继续实质审查。

☐_____

2. ☐申请人于　　年　月　日提交的修改文件，不符合专利法实施细则第51条第3款的规定。

3. 继续审查是针对下述申请文件进行的：

☐上述意见陈述书中所附的经修改的申请文件。

☑前次审查意见通知书所针对的申请文件以及上述意见陈述书中所附的经修改的申请文件替换页。

☐前次审查意见通知书所针对的申请文件。

☐上述复审决定所确定的申请文件。

☐_____

京办完成

4. ☑本通知书未引用新的对比文件。

☐本通知书引用下述对比文件(其编号续前，并在今后的审查过程中继续沿用)：

编号	文件号或名称	公开日期（或抵触申请的申请日）

5. 审查的结论性意见：

☐关于说明书：

☐申请的内容属于专利法第5条规定的不授予专利权的范围。

☐说明书不符合专利法第26条第3款的规定。

☐说明书的修改不符合专利法第33条的规定。

☐说明书的撰写不符合专利法实施细则第18条的规定。

06 NOV 2008

☐_____

☑关于权利要求书：

☑权利要求 2 不具备专利法第22条第2款规定的新颖性。

☐权利要求_____不具备专利法第22条第3款规定的创造性。

☐权利要求_____不具备专利法第22条第4款规定的实用性。

☐权利要求_____属于专利法第25条规定的不授予专利权的范围。

☐权利要求_____不符合专利法第26条第4款的规定。

☐权利要求_____不符合专利法第31条第1款的规定。

☐权利要求_____的修改不符合专利法第33条的规定。

☐权利要求_____不符合专利法实施细则第2条第1款的规定。

☐权利要求_____不符合专利法实施细则第13条第1款的规定。

☑权利要求1, 3, 8, 12, 16, 36, 72, 23-28, 48-59, 83-93不符合专利法实施细则第20条的规定。

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□权利要求_____不符合专利法实施细则第 21 条的规定。
□权利要求_____不符合专利法实施细则第 22 条的规定。
□权利要求_____不符合专利法实施细则第 23 条的规定。
□_____
□分案的申请不符合专利法实施细则第 43 条第 1 款的规定。
上述结论性意见的具体分析见本通知书的正文部分。

6. 基于上述结论性意见，审查员认为：
□申请人应按照通知书正文部分提出的要求，对申请文件进行修改。
☑申请人应在意见陈述书中论述其专利申请可以被授予专利权的理由，并对通知书正文部分中指出的不符合规定之处进行修改，否则将不能授予专利权。
□专利申请中没有可以被授予专利权的实质性内容，如果申请人没有陈述理由或者陈述理由不充分，其申请将被驳回。
□_____

7. 申请人应注意下述事项：
(1) 根据专利法第 37 条的规定，申请人应在收到本通知书之日起的贰个月内陈述意见，如果申请人无正当理由逾期不答复，其申请将被视为撤回。
(2) 申请人对其申请的修改应符合专利法第 33 条和实施细则第 51 条的规定，修改文本应一式两份，其格式应符合审查指南的有关规定。
(3) 申请人的意见陈述书和/或修改文本应邮寄或递交国家知识产权局专利局受理处，凡未邮寄或递交给受理处的文件不具备法律效力。
(4) 未经预约，申请人和/或代理人不得前来国家知识产权局专利局与审查员举行会晤。

8. 本通知书正文部分共有 7 页，并附有下述附件：
□引用的对比文件的复印件共_____份_____页。
□_____

审查员：刘[illegible]飞(9751)　　审查部门　审查协作中心
2008 年 8 月 6 日

第 2 次审查意见通知书正文

申请号：2004800193530

1、权利要求2不符合专利法第22条第2款有关新颖性的规定。

权利要求2请求保护一种热电半导体材料，对比文件1（JP2003-37302A）公开了一种热电半导体材料，并公开了（说明书第0019－0035段，第0047段、表5－表8）具有复合了复合化合物半导体相和富Te相的相，复合化合物半导体相的化学计量组成为$(Bi-Sb)_2Te_3$系的组成，该组成中包含过剩的Te，并且，根据形成该热电半导体材料的方法（第0028段），在制备阶段使Te过剩，然后采用熔融、冷却等常规方法形成，可以直接地毫无疑义地确定该热电半导体材料中富Te相分散在复合化合物半导体相的晶粒内或晶界处。由此可知，对比文件1已经公开了权利要求2请求保护的技术方案的全部技术特征，且权利要求2请求保护的技术方案与对比文件1公开的技术方案属于同一技术领域，采用了相同的技术方案，解决了相同的技术问题，并能产生相同的技术效果，因此权利要求2要求保护的技术方案不符合专利法第22条第2款有关新颖性的规定。

申请人在意见陈述书中强调，对比文件1没有公开热电半导体材料具有复合了复合化合物半导体相，更没有公开富Te相分散在复合化合物半导体相的晶粒内或晶界处（晶粒间）。但是，本申请与对比文件1中形成富Te热电半导体材料，都是在制备阶段使Te过剩，然后熔融、冷却等常规方法形成，并且使形成的热电半导体材料包含过剩的Te，而采用相同的原料相同的方法得到相同的富Te相分散在复合化合物半导体相的晶粒内或晶界处的热电半导体材料是本领域技术人员直接地毫无疑义地确定的。因此申请人陈述的理由不能被接受。

2、权利要求1、3、8、12、16、36、72以及权利要求23－28、48－59、83－93中的"急冷"是含义不确定的词语，不能明确表明"急冷的速度"是什么速度，上述权利要求不清楚，不符合专利法实施细则第20条第1款的规定。

3、即使申请人将"将旋转辊的圆周速度设定在5m/秒以下"补充到独立权利要求1、3、8、12、16、36、72中，上述独立权利要求及其从属权利要求仍然不具备创造性，不符合专利法第22条第3款的规定。

权利要求1请求保护一种热电半导体材料，对比文件1（JP2003-37302A）公开了一种热电半导体材料，并公开了（说明书第0019－0035段，第0047段、附图1，6，7，9）将由具有所需热电半导体的组成的原料合金构成的板状的热电半导体坯料14，层状

地层叠填充并固化成形而作成成形体61，对成形体61（图9c），用锻造工艺，从与热电半导体坯料14的层叠方向成直角的一轴向通过按压而在与热电半导体坯料14的层叠方向平行的一轴向上施加剪切力的方式进行塑性变形加工而成，并且通过使原料合金的熔融合金接触冷却部件表面而形成板状的热电半导体坯料。权利要求1与对比文件1相比，其区别在于：在使原料合金的熔融合金接触冷却部件表面而形成板状的热电半导体坯料时，将旋转辊的圆周速度设定在5m/秒以下，以该形成的板状的热电半导体坯料的厚度的90％以上达不到急冷的速度使上述熔融合金冷却并凝固。上述区别技术特征的作用是使形成的热电半导体坯料中形成的晶粒具有沿着作为热电半导体坯料的缓冷箱的板厚方向大致全长的长度，形成结晶取向性好的热电半导体坯料。对比文件4（JP2000-286471A）公开了一种热电半导体材料的制造方法，并公开了（第0022段，表1－4）将旋转辊的圆周速度设定在2-80m/s，上述技术特征的作用是形成高结晶性的热电半导体材料的坯料，因此对比文件1给出了限定旋转辊的圆周速度来提高结晶性的技术启示，而将旋转辊的圆周速度设定在5m/s以下是在对比文件1公开的可能的、有限的范围内选择具体的速度，这种选择可以由本领域技术人员通过常规手段得到，从而达到以该形成的板状的热电半导体坯料的厚度的90％以上达不到急冷的速度使上述熔融合金冷却并凝固的效果。因此本领域技术人员在对比文件1的基础上结合对比文件4得到权利要求1的技术方案是显而易见的，并且没有产生预料不到的技术效果，因此独立权利要求1不具备突出的实质性特点和显著的进步，不具备创造性。

权利要求8请求保护一种热电半导体元件，对比文件1（JP2003-37302A）公开了一种热电半导体材料，并公开了（说明书第0019－0035段，第0047段、附图1，6，7，9）将由具有所需热电半导体的组成的原料合金构成的板状的热电半导体坯料14，层状地层叠填充并固化成形而作成成形体61，对成形体61（图9c），用锻造工艺，从与热电半导体坯料14的层叠方向成直角的一轴向通过按压而在与热电半导体坯料14的层叠方向平行的一轴向上施加剪切力的方式进行塑性变形加工而成。权利要求8与对比文件1相比，其区别在于：1）对该热电半导体材料进行切割加工，使得可将与上述成形体的塑性变形加工时作用剪切力的一轴向大致垂直的面作为电极接合面而成；2）在使原料合金的熔融合金接触冷却部件表面而形成板状的热电半导体坯料时，将旋转辊的圆周速度设定在5m/秒以下，以该形成的板状的热电半导体坯料的厚度的90％以上达不到急冷的速度使上述熔融合金冷却并凝固。上述区别技术特征1）要解决的技术问题是将热电半导体材料加工成热电半导体元件，并使元件的电流沿层叠的膜厚方向流动；上述区别技术特征2）的作用是使形成的热电半导体坯料中形成的晶粒具有沿着作为热电半导体坯料的缓冷箱的板厚方向大致全长的长度，形成结晶取向性好的热电半导体坯

料。

对于区别技术特征1），对比文件2（JP5-335628）公开了一种热电半导体元件，并公开了（第0019-0020段，第0028-0040段、附图1）将由具所需热电半导体的组成的原料合金，融合并冷却形成板状的热电半导体坯料，然后层状地层叠填充并固化成形而作成热电半导体材料，对该热电半导体材料进行切割加工，使得可将与膜厚垂直的方向形成电极6，电流沿与膜厚平行的方向流动，其作用与在本发明中的作用相同。对于区别技术特征2），对比文件4（JP2000-286471A）公开了一种热电半导体材料的制造方法，并公开了（第0022段，表1－4）将旋转辊的圆周速度设定在2-80m/s，上述技术特征的作用是形成高结晶性的热电半导体材料的坯料，因此对比文件1给出了限定旋转辊的圆周速度来提高结晶性的技术启示，而将旋转辊的圆周速度设定在5m/s以下是在对比文件1公开的可能的、有限的范围内选择具体的速度，这种选择可以由本领域技术人员通过常规手段得到，从而达到以该形成的板状的热电半导体坯料的厚度的90%以上达不到急冷的速度使上述熔融合金冷却并凝固的效果。因此本领域技术人员在对比文件1的基础上结合对比文件2、4得到权利要求8的技术方案是显而易见的，并且没有产生预料不到的技术效果，因此独立权利要求8不具备突出的实质性特点和显著的进步，不具备创造性。

权利要求12请求保护一种热电模块，对比文件3（CN1233347A）公开了一种热电模块，并公开了（说明书第14页第3段至第16页最后1段，第1页第3段、附图12）将由具有P型的热电半导体的组成的原料合金构成的板状的热电半导体坯料、和由具有N型的热电半导体的组成的原料合金构成的板状的热电半导体坯料，分别进行塑性变形加工而作成P型及N型的热电半导体材料，对该P型和N型的各热电半导体材料进行切割加工，使得可将与膜厚垂直的面作为电极接合面，并分别形成P型和N型的各热电半导体元件5、6，将该P型和N型的各热电半导体元件，在使热电半导体元件的热电性能大的结晶方位上排列配置，并且经由金属电极7接合P型和N型的各热电半导体元件5、6而形成PN元件对，该热电模块具有备有该PN元件对的结构。权利要求12与对比文件3相比，其区别在于：1）将热电半导体坯料分别层状地层叠填充并固化成形而作成成形体，对具有P型和N型的热电半导体组成的成形体，分别以从与热电半导体坯料的主要层叠方向成直角或接近直角的一轴向按压而在与上述热电半导体坯料的主要层叠方向大致平行的一轴向上施加剪切力的方式进行塑性变形加工；2）在使原料合金的熔融合金接触冷却部件表面而形成板状的热电半导体坯料时，将旋转辊的圆周速度设定在5m/秒以下，以该形成的板状的热电半导体坯料的厚度的90%以上达不到急冷的速度使上述熔融合金冷却并凝固。上述区别技术特征1）要解决的技术问题是将热电半导体坯料通过

层叠进行塑性变形加工形成热电半导体材料，上述区别技术特征2）的作用是使形成的热电半导体坯料中形成的晶粒具有沿着作为热电半导体坯料的缓冷箱的板厚方向大致全长的长度，形成结晶取向性好的热电半导体坯料。

对于区别技术特征1），对比文件1公开了一种热电半导体材料，并公开了（说明书第0019－0035段，第0047段、附图1，6，7，9）将由具有所需热电半导体的组成的原料合金构成的板状的热电半导体坯料14，层状地层叠填充并固化成形而作成成形体61，对成形体61（图9c），用锻造工艺，从与热电半导体坯料14的层叠方向成直角的一轴向通过按压而在与热电半导体坯料14的层叠方向平行的一轴向上施加剪切力的方式进行塑性变形加工而成。上述技术特征在对比文件1中的作用是将热电半导体坯料通过层叠进行塑性变形加工形成热电半导体材料，与在本发明中的作用相同。可见对比文件1给出了将上述技术特征用于对比文件3以解决其存在的技术问题的启示。对于区别技术特征2），对比文件4（JP2000-286471A）公开了一种热电半导体材料的制造方法，并公开了（第0022段，表1－4）将旋转辊的圆周速度设定在2-80m/s，上述技术特征的作用是形成高结晶性的热电半导体材料的坯料，因此对比文件1给出了限定旋转辊的圆周速度来提高结晶性的技术启示，而将旋转辊的圆周速度设定在5m/s以下是在对比文件1公开的可能的、有限的范围内选择具体的速度，这种选择可以由本领域技术人员通过常规手段得到，从而达到以该形成的板状的热电半导体坯料的厚度的90％以上达不到急冷的速度使上述熔融合金冷却并凝固的效果。因此本领域技术人员在对比文件3的基础上结合对比文件1、4得到权利要求12的技术方案是显而易见的，并且没有产生预料不到的技术效果，因此独立权利要求12不具备突出的实质性特点和显著的进步，不具备创造性。

权利要求16请求保护一种热电半导体材料的制造方法，对比文件1（JP2003-37302A）公开了一种热电半导体材料的制造方法，并公开了（说明书第0019－0035段，第0047段、附图1，6，7，9）将由具有所需热电半导体的组成的原料合金41熔融后，使该熔融合金41接触冷却部件14表面而制作成板状的热电半导体坯料14，然后，使该热电半导体坯料与板厚方向平行地层叠并固化成形而作成成形体61，对成形体61（图9c），用锻造工艺，在限制其向与热电半导体坯料61的层叠方向正交的平面内交叉的两个轴向轴的一个轴向的变形的状态下，从另一轴向按压而在与热电半导体坯料14的层叠方向平行的一轴向上施加剪切力，进行塑性变形加工而成热电半导体材料。权利要求16与对比文件1相比，其区别在于：在使原料合金的熔融合金接触冷却部件表面而形成板状的热电半导体坯料时，将旋转辊的圆周速度设定在5m/秒以下，以该形成的板状的热电半导体坯料的厚度的90％以上达不到急冷的速度使上述熔融合金冷却并

凝固。上述区别技术特征的作用是使形成的热电半导体坯料中形成的晶粒具有沿着作为热电半导体坯料的缓冷箱的板厚方向大致全长的长度，形成结晶取向性好的热电半导体坯料。对比文件4（JP2000-286471A）公开了一种热电半导体材料的制造方法，并公开了（第0022段，表1—4）将旋转辊的圆周速度设定在2-80m/s，上述技术特征的作用是形成高结晶性的热电半导体材料的坯料，因此对比文件1给出了限定旋转辊的圆周速度来提高结晶性的技术启示，而将旋转辊的圆周速度设定在5m/s以下是在对比文件1公开的可能的、有限的范围内选择具体的速度，这种选择可以由本领域技术人员通过常规手段得到，从而达到以该形成的板状的热电半导体坯料的厚度的90％以上达不到急冷的速度使上述熔融合金冷却并凝固的效果。因此本领域技术人员在对比文件1的基础上结合对比文件4得到权利要求16的技术方案是显而易见的，并且没有产生预料不到的技术效果，因此独立权利要求16不具备突出的实质性特点和显著的进步，不具备创造性。

权利要求36请求保护一种热电半导体元件的制造方法，对比文件1（JP2003-37302A）公开了一种热电半导体材料的制造方法，并公开了（说明书第0019－0035段，第0047段、附图1，6，7，9）将由具有所需热电半导体的组成的原料合金41熔融后，使该熔融合金41接触冷却部件14表面而制作成板状的热电半导体坯料14，然后，使该热电半导体坯料与板厚方向平行地层叠并固化成形而作成成形体61，对成形体61（图9c），用锻造工艺，在限制其向与热电半导体坯料61的层叠方向正交的平面内交叉的两个轴向轴的一个轴向的变形的状态下，从另一轴向按压而在与热电半导体坯料14的层叠方向平行的一轴向上施加剪切力，进行塑性变形加工而成热电半导体材料。权利要求36与对比文件1相比，其区别在于：1）对该热电半导体材料进行切割加工，使得可将与上述成形体的塑性变形加工时作用剪切力的一轴向大致垂直的面作为电极接合面，从而形成热电半导体元件；2）在使原料合金的熔融合金接触冷却部件表面而形成板状的热电半导体坯料时，将旋转辊的圆周速度设定在5m/秒以下，以该形成的板状的热电半导体坯料的厚度的90％以上达不到急冷的速度使上述熔融合金冷却并凝固。上述区别技术特征1）要解决的技术问题是将热电半导体材料加工成热电半导体元件，并使元件的电流沿层叠的膜厚方向流动；上述区别技术特征2）的作用是使形成的热电半导体坯料中形成的晶粒具有沿着作为热电半导体坯料的缓冷箱的板厚方向大致全长的长度，形成结晶取向性好的热电半导体坯料。

对于区别技术特征1），对比文件2（JP5-335628）公开了一种热电半导体元件的制造方法，并公开了（第0019-0020段，第0028-0040段、附图1）将由具所需热电半导体的组成的原料合金，融合并冷却形成板状的热电半导体坯料，然后层状地层叠填充

并固化成形而作成热电半导体材料，对该热电半导体材料进行切割加工，使得可将与膜厚垂直的方向形成电极6，电流沿与膜厚平行的方向流动，形成热电半导体元件，其作用与在本发明中的作用相同。对于区别技术特征2），对比文件4（JP2000-286471A）公开了一种热电半导体材料的制造方法，并公开了（第0022段，表1－4）将旋转辊的圆周速度设定在2-80m/s，上述技术特征的作用是形成高结晶性的热电半导体材料的坯料，因此对比文件1给出了限定旋转辊的圆周速度来提高结晶性的技术启示，而将旋转辊的圆周速度设定在5m/s以下是在对比文件1公开的可能的、有限的范围内选择具体的速度，这种选择可以由本领域技术人员通过常规手段得到，从而达到以该形成的板状的热电半导体坯料的厚度的90%以上达不到急冷的速度使上述熔融合金冷却并凝固的效果。因此本领域技术人员在对比文件1的基础上结合对比文件2、4得到权利要求36的技术方案是显而易见的，并且没有产生预料不到的技术效果，因此独立权利要求36不具备突出的实质性特点和显著的进步，不具备创造性。

权利要求72请求保护一种热电模块的制造方法，对比文件3（CN1233347A）公开了一种热电模块的制造方法，并公开了（说明书第14页第3段至第16页最后1段，第1页第3段、附图12）分别熔融具有P型和N型的热电半导体的组成的原料合金，将各熔融合金借助冷却部件的表面缓慢冷却分别形成具有P型和N型的热电半导体组成的板状的热电半导体坯料，分别进行塑性变形加工而作成P型及N型的热电半导体材料，对该P型和N型的各热电半导体材料进行切割加工，使得可将与膜厚垂直的面作为电极接合面，并分别形成P型和N型的各热电半导体元件5、6，将该P型和N型的各热电半导体元件，在使热电半导体元件的热电性能大的结晶方位上排列配置，并且经由金属电极7接合P型和N型的各热电半导体元件5、6而形成PN元件对，该热电模块具有备有该PN元件对的结构。权利要求72与对比文件3相比，其区别在于：1）将该P型和N型的各热电半导体坯料，分别与板厚方向大致平行地层叠填充并固化成形而作成成形体，接着，对该具有P型的热电半导体的组成的成形体和具有N型的热电半导体组成的各成形体，分别在限制其向与上述热电半导体坯料的主要层叠方向大致正交的平面内交叉的两个轴向中的一个轴向的变形的状态下，从另一个轴向按压而在与上述热电半导体坯料的主要层叠方向大致平行的一轴向上作用剪切力；2）在使原料合金的熔融合金接触冷却部件表面而形成板状的热电半导体坯料时，将旋转辊的圆周速度设定在5m/秒以下，以该形成的板状的热电半导体坯料的厚度的90%以上达不到急冷的速度使上述熔融合金冷却并凝固。上述区别技术特征1）的作用是将热电半导体坯料层叠后进行塑性变形加工分别形成P型和N型热电半导体材料；上述区别技术特征2）的作用是使形成的热电半导体坯料中形成的晶粒具有沿着作为热电半导体坯料的缓冷箱的板厚方向大致全长的长度，形

成结晶取向性好的热电半导体坯料。

对于区别技术特征1），对比文件1公开了一种热电半导体材料的制造方法，并公开了（说明书第0019－0035段，第0047段、附图1，6，7，9）将由具有所需热电半导体的组成的原料合金41熔融后，使该熔融合金41接触冷却部件14表面而制作成板状的热电半导体坯料14，然后，使该热电半导体坯料与板厚方向平行地层叠并固化成形而作成成形体61，对成形体61（图9c），用锻造工艺，在限制其向与热电半导体坯料61的层叠方向正交的平面内交叉的两个轴向轴的一个轴向的变形的状态下，从另一轴向按压而在与热电半导体坯料14的层叠方向平行的一轴向上施加剪切力，进行塑性变形加工而成热电半导体材料。上述技术特征在对比文件1中的作用是将热电半导体坯料层叠后进行塑性变形加工形成热电半导体材料，与在本发明中的作用相同；对于区别技术特征2），对比文件4（JP2000-286471A）公开了一种热电半导体材料的制造方法，并公开了（第0022段，表1－4）将旋转辊的圆周速度设定在2-80m/s，上述技术特征的作用是形成高结晶性的热电半导体材料的坯料，因此对比文件1给出了限定旋转辊的圆周速度来提高结晶性的技术启示，而将旋转辊的圆周速度设定在5m/s以下是在对比文件1公开的可能的、有限的范围内选择具体的速度，这种选择可以由本领域技术人员通过常规手段得到，从而达到以该形成的板状的热电半导体坯料的厚度的90％以上达不到急冷的速度使上述熔融合金冷却并凝固的效果。因此本领域技术人员在对比文件1的基础上结合对比文件2、4得到权利要求72的技术方案是显而易见的，并且没有产生预料不到的技术效果，因此独立权利要求72不具备突出的实质性特点和显著的进步，不具备创造性。

从属权利要求4－7、9－11、13－15、17－35、37－71、73－115的附加技术特征没有修改，仅适应性改变了序号，基于第一次审查意见通知书中相同的理由，当引用的权利要求不具备创造性时，上述从属权利要求也不具备创造性，不符合专利法第22条第3款的规定。

申请人可以将"将旋转辊的圆周速度设定在2m/秒以下"补充到独立权利要求1、3、8、12、16、36、72中以克服上述缺陷。

3、从属权利要求23－28、48－59、83－93的技术特征已经在其直接或间接引用的独立权利要求16、36、72记载，因此出现重复限定，权利要求23－28、48－59、83－93造成权利要求书不简要，不符合专利法实施细则第20条第1款的规定。

4、基于上述理由，本申请按目前的文本是不能授权的，申请人应根据上述审查意见在本通知指定的2个月答复期限内提交修改后的申请文件，修改时应满足专利法第33条的规定，不得超出原说明书和权利要求书的记载范围；在意见陈述书中充分论述修改后的权利要求书相对于审查员引用的对比文件具有新颖性和创造性的理由。

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